

Technology Opportunity

Jet Mixing Enhancement by Tabs

It is now possible to significantly increase the spreading and mixing of a jet flow by minor modifications to the nozzle that discharges the jet. The technique involves the placement of small protrusions or “tabs” at the nozzle exit. The National Aeronautics and Space Administration (NASA) seeks to develop additional applications of this technology.

Potential Commercial Uses

- Faster mixing of reactants in chemical processes
- Better mixing of ingredients in food processing
- Rapid dissipation of exhaust gas from pipes
- Efficient mixing of fuel and air in combustors
- Efficient cooling of hot components in various applications
- Noise reduction in supersonic jets

Benefits

- Simple, robust
- Low cost, low maintenance
- Increased efficiency

The Technology

A tab produces a pair of counterrotating streamwise vortices. These vortices tend to persist in the flow and are responsible for transporting high velocity fluid from the core of the jet into the surrounding fluid, and vice versa. The tab needs to be placed right at the nozzle exit. A triangular shaped tab with its base on the nozzle wall and apex tilted downstream works best. For a given nozzle, a combination of several tabs may be most effective. For example, four equally spaced tabs, each representing an area blockage of about two percent of the nozzle exit area, have been found to work best for a circular nozzle. The figure shows the Mach number distribution, measured 14 diameters downstream from the nozzle, on a cross sectional plane of a supersonic jet. As can be seen, the four tabs mix the jet with the surrounding fluid very efficiently, thereby spreading the jet’s cross section much farther.

Options for Commercialization

Seeking partnerships with industry to further develop additional applications of this technology.

Contact

Katherine K. Martin
High Speed Research Propulsion Project Office
Mail Stop 60-2
NASA Lewis Research Center
Cleveland OH 44135
Phone: 216/977-7122
Fax: 216/977-7133
e-Mail: katherine.martin@lerc.nasa.gov

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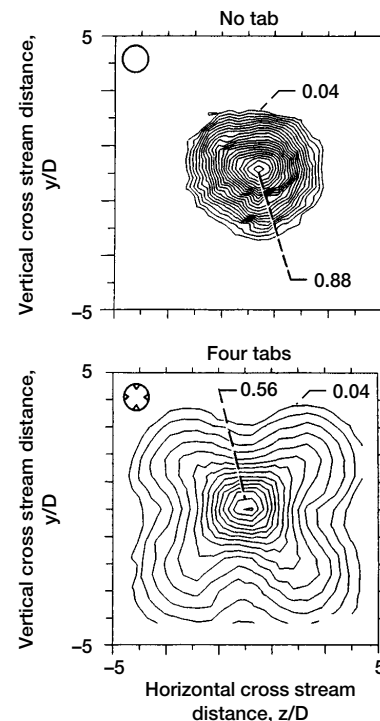


Figure 1.—Cross section of jet flow from a nozzle with and without tabs.



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